

Outline

- What is the problem?
- Requirements definition
 - Analysis of port facilities
- Options assessment
 - Analysis approach
- Summary







05 September ੴ₽Ŝtl 2006



Dstl is part of the Ministry of Defence

What is the problem?

- Offload at desired location
- Facilities may not be available
 - Well found port all facilities required for offload
 - Additional equipment to offload through non-well found (austere) port
- Likelihood of using an austere port?
- What equipment / technology will enable offload?
- Firstly, what we mean by austere...

05 September

9**9**§tl 2006

dsti









Port austerity scale

- Traditionally, 4 point scale:
 - Well found
 - Austere
 - Bare base
 - Beach

dstl

- "Austere" used to describe wide range of port capabilities
- Therefore, proposed an austerity scale with better granularity

05 September

9**9**8tl 2006







Dstl is part of the Ministry of Defence

Austerity definitions

- List of factors affecting port austerity agreed through military judgement
 - Approach (anchorage, fairway depth and width)
 - Berthing (jetty space, slipway, RoRo berths)
 - Offload (cranes, container handling, mechanical handling equipment, marshalling area, main supply routes)
- Threshold values for these factors defined at each level
- Separate austerity scales defined for container and vehicle offload capabilities





Other factors affecting port access

- Austerity levels calculated based on fixed facilities
- There are other variable factors that have an impact on austerity
- Number of these factors identified
- Effect of these will be addressed in analysis

- Factors identified:
 - Enemy occupation
 - Enemy denial
 - Asymmetric threat
 - Political unrest
 - Excessive demand
 - Commercial priority
 - Accident
 - Weather
 - Tides
 - NEQ limit



05 September 9999Stl 2006



Ports database

- Need to understand requirement to offload in ports of varying austerity levels
- Therefore, need to understand capabilities of ports that may be used to offload shipping
- Databases of available ports and descriptions of their facilities are available, but no assessment of utility
- Therefore, new database compiled which assesses ports against austerity level definitions



September §tl 2006



Dstl is part of the Ministry of Defence

Example of ports database

Ports Database Version 1.6 (Final) NOT FOR OPERATIONAL USE





05 September CPDStl 2006



Dstl is part of the Ministry of Defence

Sea conditions analysis

- Need to understand potential requirement to operate in variety of sea conditions
- Study undertaken to gather sea conditions data
- Benefits:
 - Define requirement for sea condition reduction technologies
 - Provide input to analysis of technology options against requirement
 - Potential to provide input to other studies





Analysis approach

Dstl MarFlow model

- Data driven, generic process model
- Previously used in a variety of studies





05 September €099€tl 2006



Dstl is part of the Ministry of Defence

MarFlow modelling concepts

- Stock Items = Objects to be supplied
- Route = Sequence of steps by which stock items travel
- Resources = Assets required by the stock item during each step
 - Limited in number



Stock items

- Variable number of stock item types
- Demand or arrival of stock items expressed as a schedule
- Each schedule entry requests one or more stock items, of one or more type



14

Dstl is part of the

Ministry of Defence

Routes

- Route for each stock type broken down into a number of steps
- For each step, define:
 - Resources and time required (may vary by stock type)
 - Time may be expressed as distribution
 - Rule for selecting next step
 - Probability
 - Condition (e.g. choose step with shortest queue)





Dstl is part of the Ministry of Defence

05 September CPBStl 2006

Resources

- Total number of resources available specified
- In general, a resource may be:
 - Re-usable immediately after use
 - Re-usable, but only after a certain time
 - Consumable cannot be re-used
- More than one type of resource may be able to do a particular job, particular resource may be preferred
- Resources arranged in sets: model allows resources to be chosen in a preferred order



Model outputs

- Total time taken for offload
- Resource utilisation over time
- Queuing information
- Details of routes taken for individual stock items



B

18

Dstl is part of the

Ministry of Defence

Example outputs





05 September ਫ⁰99€tl 2006



Dstl is part of the Ministry of Defence

MarFLOW validation

- Gather real life / representative data
 - Includes understanding how system works
- Implement data in MarFLOW
- Present results to a military panel
 - Iterative process









05 September ਫ⁰99€tl 2006



Dstl is part of the Ministry of Defence

Options assessment

- Select mixes of technology options to assess
- Baseline analysis:
 - Use model outputs to assess ability of option mixes to meet defined requirement in a range of scenarios
- Sensitivity analysis:
 - Vary inputs (e.g. port austerity, sea conditions) and use model outputs to ensure that baseline analysis is robust to changes



22

Littoral Watercraft study

- Watercraft options may have wider utility
 - Surface Manoeuvre assault
 - Surface Manoeuvre sustain
 - Maritime Intra Theatre Lift
- Roles have distinct requirements with a varying degree of overlap
- Equipment being procured for some roles but not others
 - Implicit assumption that assets will be shared between roles
- Analysis required to test validity of this assumption
 - Take into account concurrency issues and overall requirement



Littoral Watercraft study

- MSc student investigating potential analysis approaches
 - Dissertation due end September 06
- Analysis approach:
 - Identify role / watercraft mapping
 - Define scenario as list of roles with associated time and location
 - Find best assignment of watercraft to roles, taking into account:
 - Suitability of watercraft for role
 - Concurrency of roles
 - Transport of watercraft between roles



Summary

- Requirement exists to offload in ports of varying austerity
- Analysis being conducted:
 - Define requirement
 - Assess option mixes against requirement
- Littoral watercraft study will consider wider use



Dstl is part of the Ministry of Defence



Carly Porrett Maritime Logistics Team Maritime Effects Analysis Group Dstl Naval Systems Department Dstl Portsdown West Fareham Hampshire PO17 6AD Tel: +44 (0) 23 9221 7916 Email: czporrett@dstl.gov.uk